



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,858	12/10/2003	Wenxian Zhu	NOVLP090/NVLS002888	7860
22434	7590	03/24/2006	EXAMINER	
BEYER WEAVER & THOMAS LLP P.O. BOX 70250 OAKLAND, CA 94612-0250			SMITH, BRADLEY	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 03/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/733,858	Applicant(s) ZHU ET AL.	
	Examiner Bradley K. Smith	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/9/06, 1-18-06</u> | 6) <input checked="" type="checkbox"/> Other: <u>search notes</u> |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/9/06 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-10 and 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (US 2005/0074946). With regards to claims 1, 16 and 17, Chu et al. disclose partially filling a gap on a semiconductor substrate with a dielectric using a high density plasma chemical vapor deposition process; partially removing dielectric deposited in the gap from the gap opening by an etch back process conducted with etch process chemistry consisting essentially of hydrogen, wherein the substrate is biased during the etch back process and the etch rate is determined by the substrate

bias power; and further filling of the partially filled gap by a high density plasma chemical vapor deposition process (see paragraphs 0019-0027). With regards to claim 2, the process is repeated until the gap is filled (see paragraph 0025). With regards to claim 3, a high density plasma would inherently be isotropic type of plasma etching and this is well known to one of ordinary skill in the art. With regards to claim 4, it is inherent that when one increases the power one will increase the etch rate. With regards to claims 5-7, 12, 13, 15, 19 and 20 Chu et al. disclose the claimed parameters (see Table 1). With regards to claims 8, 9, and 18, Chu et al. disclose the etch chemistry includes He (see paragraph 0023). With regards to claim 10, Chu et al. disclose the use of one chamber. With regard to claim 14 Chu et al. disclose the deposited dielectric is silicon oxide (see claim 1). However, Chu et al. fails to expressly disclose performing an etch process without a silicon containing dielectric precursor. But Chu does disclose alter the He/H₂ gas content to "70% or above" (see paragraph 0023), and the examiner understands this to mean or above to mean up to and including 100%. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Chu et al. because Chu teach changing the percentage of He/H₂ with respect to the aspect ratio (i.e. with very large aspect ratio one would want 100% He/H₂) (see 0023).

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (as rejected above) in view of Williams et al (US Pregrant Publication 2004/0020894). Chu et al. disclose partially filling a gap on a semiconductor substrate with a dielectric using a high density plasma chemical vapor deposition process;

Art Unit: 2891

partially removing dielectric deposited in the gap from the gap opening by an etch back process conducted with etch process chemistry consisting essentially of hydrogen, wherein the substrate is biased during the etch back process and the etch rate is determined by the substrate bias power; and further filling of the partially filled gap by a high density plasma chemical vapor deposition process (see paragraphs 0019-0027). However Chu et al fails to disclose the use of radio frequency inductively coupled plasma. Whereas Williams et al. disclose the use of radio frequency inductively coupled plasma. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chu et al. and Williams because the radio frequency inductively coupled plasma has good selectivity, control, and through-put (see Williams et al. paragraph 0003).

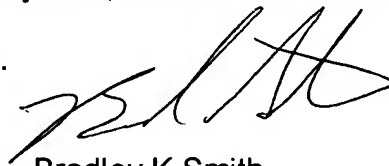
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K. Smith whose telephone number is 571-272-1884. The examiner can normally be reached on 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2891

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'B. K. Smith', is positioned above the printed name.

Bradley K Smith
Primary Examiner
Art Unit 2891

3.